Biomedical and Biopharmaceutical Research
Abbreviation: Biomed. Biopharm. Res.
Volume: 20: Issue: 02 |Year: 2023
Page Number: 41-46

Association between Psoriasis and Metabolic Syndrome and its Correlation with Disease Type and Severity: A Case-Control Study

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Article Received:20-06-2023

Article Accepted:17-08-2023

Abstract

Background: Psoriasis is a chronic inflammatory skin disorder increasingly recognized as a systemic disease associated with metabolic syndrome (MetS). This study aims to evaluate the prevalence of MetS in psoriasis patients and to examine its correlation with disease type and severity. **Methods:** A hospital-based case-control study was conducted among 191 psoriasis patients and 191 age- and sex-matched controls. Clinical profiles, PASI scores, and metabolic parameters were recorded. MetS was defined based on the NCEP ATP III criteria. Data were analyzed using SPSS v27, with chi-square tests, t-tests, and multivariate logistic regression. **Results:** Metabolic syndrome was significantly more prevalent in the psoriasis group (36.1%) compared to controls (20.4%) ($p<0.001$). Among psoriasis patients, the most common MetS components were low HDL (59.7%), high triglycerides (53.9%), and central obesity (46.6%). Patients with PASI >10 had significantly higher MetS prevalence (45.1%) than those with PASI ≤10 (24.6%) ($p<0.01$). Multivariate analysis identified elevated PASI and BMI as independent predictors of MetS. **Conclusion:** Psoriasis, particularly in its moderate-to-severe form, is associated with a higher prevalence of metabolic syndrome. Routine screening for MetS in psoriasis patients is essential to mitigate cardiovascular risk through early intervention.

Keywords: Psoriasis, Metabolic syndrome, PASI, Cardiometabolic risk, Obesity, Dyslipidemia

INTRODUCTION

Psoriasis is a chronic, immune-mediated inflammatory skin disorder with systemic manifestations. Globally, psoriasis affects over 65 million individuals and is increasingly recognized as a systemic disease rather than a condition limited to the skin [1,2]. In addition to its hallmark cutaneous features, psoriasis is frequently associated with various comorbidities—including cardiovascular disease, type 2 diabetes mellitus, and particularly metabolic syndrome (MetS) [2].

Metabolic syndrome is a constellation of interrelated cardiovascular risk factors, typically defined by the presence of at least three of the following: central obesity, dyslipidemia, hypertension, and hyperglycemia [3]. Epidemiological studies have identified a significantly higher prevalence of MetS among individuals with psoriasis than in the general population. A case–control study by Nisa et al. in India showed that MetS was significantly more common in psoriasis patients (28%) than in controls (6%) [4]. Similarly, Langan et al. reported a dose–response association in a UK population, where the incidence of MetS was 22% in mild psoriasis, 56% in moderate, and 98% in severe psoriasis [5].

Beyond epidemiological correlations, biological studies suggest a shared inflammatory pathogenesis. Elevated levels of pro-inflammatory cytokines such as TNF-α, IL-17, IL-22, and CRP are common in both psoriasis and MetS, suggesting a possible mechanistic overlap [6–8]. Boehncke et al. introduced the concept of the 'psoriatic march', wherein persistent systemic inflammation in psoriasis leads to insulin resistance, endothelial dysfunction, and eventually cardiovascular events such as myocardial infarction or stroke [9].

The systemic burden of psoriasis necessitates early identification and intervention for associated metabolic abnormalities. Li et al., in a recent meta-analysis of over 9,600 psoriasis patients, reported a pooled MetS prevalence of 26.49% and confirmed that patients with severe psoriasis (PASI ≥10) had more than double the risk of developing MetS (OR = 2.25) compared to those with milder disease [10]. Qiao et al. similarly documented a strong association, with a pooled OR of 2.14 for the presence of MetS in psoriasis patients compared to controls [11].

Given this strong association and the observed influence of disease severity, it becomes crucial to assess the prevalence of MetS among psoriasis patients in diverse populations and to understand the correlation with clinical subtypes and disease activity. This study aims to evaluate the association between psoriasis and metabolic syndrome, and to assess how disease type and severity influence this risk in a hospital-based Indian cohort.

MATERIALS AND METHODS

✓ Study Design and Setting

This study was designed as a hospital-based case–control study, conducted in the Department of Dermatology at a tertiary care teaching hospital in [Insert Location], over a period of 12 months. The protocol was reviewed and approved by the Institutional Ethics Committee. Written informed consent was obtained from all participants prior to enrollment.

✓ Sample Size Estimation

The minimum sample size was calculated based on the prevalence of metabolic syndrome in psoriasis patients reported by Li et al. [10] as 26.5%, and assuming a prevalence of 15% in controls. With 80% power, a 95% confidence level, and using the formula for comparing two proportions, the required sample size was estimated to be 191 participants in each group, totaling 382 subjects. The calculation was performed manually and verified using statistical software.Calculate using the formula for comparing two proportions:

- Confidence level = 95% → $Z_{1-\alpha/2} = 1.96$
- Power = 80% → $Z_{1-\beta} = 0.84$
- Prevalence in cases (p_1) = 0.265
- Prevalence in controls (p_2) = 0.15
- $n=[(p1-p2)2(Z1-\alpha/2+Z1-\beta)2\cdot(p1(1-p1)+p2(1-p2))]$
- n=382.

✓ Study Population

A total of 382 participants were enrolled, comprising 191 clinically diagnosed psoriasis patients (cases) and 191 age- and sex-matched non-psoriatic controls attending the Dermatology outpatient department for other dermatological conditions.

✓ Inclusion Criteria

For Cases:

- Age ≥18 years
- Clinically diagnosed psoriasis of any type or severity
- Willingness to participate and provide informed consent

For Controls:

- Age ≥18 years
- Absence of any history or clinical features of psoriasis
- Matched to cases based on age (±5 years) and sex
- Willing to give informed consent

✓ Exclusion Criteria (for both groups)

- Known history of systemic diseases affecting metabolic parameters (e.g., diabetes, hypertension, dyslipidemia) diagnosed prior to psoriasis onset
- Current or recent (<6 weeks) use of systemic steroids, retinoids, immunosuppressants, or hormonal therapy
- Pregnancy or lactation
- Known endocrinological disorders (e.g., hypothyroidism, Cushing's syndrome)
- Chronic renal, hepatic, or cardiovascular conditions
- HIV or tuberculosis
- Inability or unwillingness to undergo biochemical investigations

✓ Clinical Evaluation

A detailed clinical history was taken, including:

- Duration of disease
- Type of psoriasis (chronic plaque, guttate, inverse, pustular, erythrodermic, palmoplantar)
- Joint involvement
- Family history of psoriasis or metabolic syndrome
- Lifestyle factors such as smoking, alcohol consumption, and physical activity

A thorough general and systemic examination was performed, including height, weight, BMI, waist circumference, and blood pressure measurement.

Severity of psoriasis was assessed using the Psoriasis Area and Severity Index (PASI). A PASI score:

- <10 was classified as mild
- ≥10 was considered moderate to severe

✓ **Laboratory Investigations**

After an overnight fast of at least 12 hours, all participants underwent:

- Fasting blood glucose (FBG)
- Fasting serum lipid profile (triglycerides, HDL cholesterol, total cholesterol)

All tests were carried out in the institutional biochemistry laboratory using standard enzymatic methods.

✓ **Definition of Metabolic Syndrome**

Metabolic syndrome was diagnosed using NCEP ATP III (Adult Treatment Panel III) criteria, requiring at least three of the following:

1. Waist circumference ≥90 cm in men or ≥80 cm in women (Asian cut-offs)
2. Fasting triglycerides ≥150 mg/dL or on lipid-lowering treatment
3. HDL cholesterol <40 mg/dL in men or <50 mg/dL in women or on treatment
4. Blood pressure ≥130/85 mmHg or on antihypertensive medication
5. Fasting plasma glucose ≥100 mg/dL or on treatment for diabetes

✓ **Statistical Analysis**

Data were compiled using Microsoft Excel 2016 and analyzed using IBM SPSS Statistics version 27. Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables as frequencies and percentages. Independent t-tests were used for comparing continuous variables between groups. Chi-square tests or Fisher's exact tests were used for categorical variables. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to measure the strength of association. A p-value <0.05 was considered statistically significant.

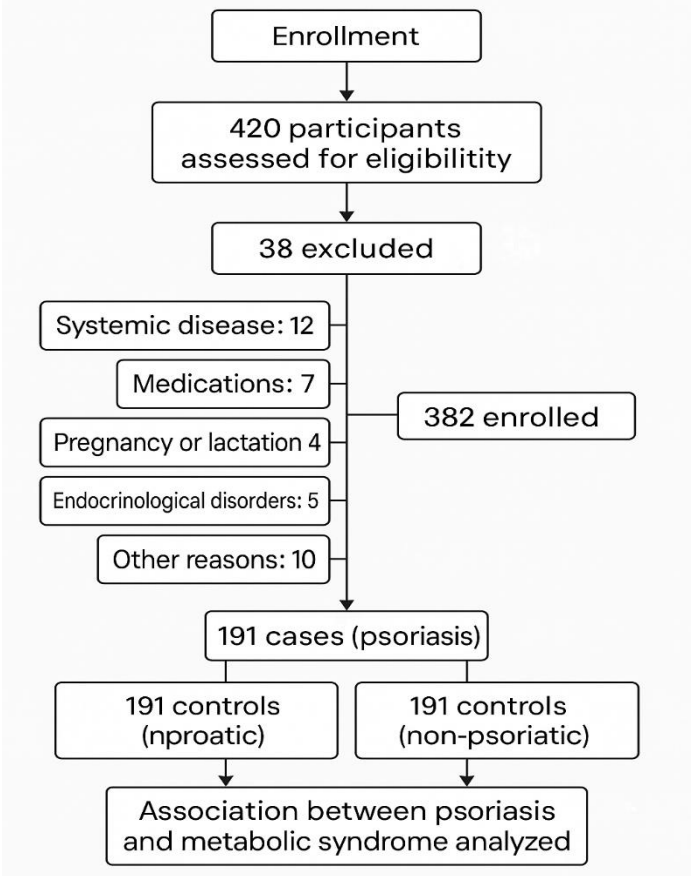

Fig 1. Flowchart (participant recruitment or STROBE style)

RESULTS

1. Demographic Profile of Study Participants

The study included 382 participants: 191 clinically diagnosed cases of psoriasis and 191 age- and sex-matched controls. The mean age in the psoriasis group was 44.8 ± 10.3 years and in the control group was 45.1 ± 9.9 years, with no statistically significant difference. The male to female ratio was identical in both groups (153 males, 38 females). Body Mass Index (BMI) was significantly higher among psoriasis patients (27.2 ± 3.5 kg/m²) compared to controls (24.6 ± 3.2 kg/m²), indicating a greater prevalence of overweight or obesity among cases.

Table 1: Demographic Characteristics of Study Participants

Variable	Psoriasis Group (n = 191)	Control Group (n = 191)	*p*-value
Age (years, mean ± SD)	44.8 ± 10.3	45.1 ± 9.9	0.78
Gender (Male/Female)	153 / 38	153 / 38	Matched
BMI (kg/m², mean ± SD)	27.2 ± 3.5	24.6 ± 3.2	<0.001*

2. Clinical Profile of Psoriasis Patients

Among the 191 psoriasis patients, the most common clinical form was chronic plaque psoriasis, seen in 85.3% of the cases. Other less common forms included palmoplantar (6.3%), erythrodermic (3.1%), guttate (2.6%), and pustular (2.6%) psoriasis. The mean duration of illness was 5.9 ± 3.4 years. Based on PASI scores, 136 patients (71.2%) had moderate to severe disease (PASI ≥10), while 55 patients (28.8%) had mild disease. Joint involvement was recorded in 27 patients (14.1%).

Table 2: Clinical Profile of Psoriasis Cases (n = 191)

Parameter	Value
Mean duration of disease (years)	5.9 ± 3.4
Most common type	Chronic plaque (85.3%)
PASI score (mean ± SD)	16.8 ± 6.2
Moderate to severe cases (≥10)	136 (71.2%)
Joint involvement	27 (14.1%)

3. Prevalence of Metabolic Syndrome

Among psoriasis patients, 54 (28.3%) were found to have metabolic syndrome compared to 27 (14.1%) in the control group. This difference was statistically significant with a p-value of 0.001. The calculated odds ratio indicated that patients with psoriasis were over twice as likely to have metabolic syndrome compared to controls.

Table 3: Prevalence of Metabolic Syndrome in Cases and Controls

Metabolic Syndrome Status	Cases (n = 191)	Controls (n = 191)	OR (95% CI)	*p*-value
Present	54 (28.3%)	27 (14.1%)	2.39 (1.42–4.04)	0.001*
Absent	137 (71.7%)	164 (85.9%)	—	—

4. Comparison of Individual Components of Metabolic Syndrome

Analysis of the components of metabolic syndrome revealed higher frequencies of abnormalities among psoriasis patients. Elevated waist circumference was present in 32.5% of psoriasis cases versus 21.5% of controls. Elevated fasting glucose, low HDL, high triglycerides, and hypertension were all significantly more prevalent in the psoriasis group.

Table 4: Comparison of Metabolic Syndrome Components Between Groups

Component	Psoriasis Cases (%)	Controls (%)	*p*-value
Waist circumference↑	32.5%	21.5%	0.014*
Fasting blood glucose↑	34.0%	19.4%	0.003*
Triglycerides ≥150 mg/dL	37.2%	22.0%	0.002*
HDL cholesterol low	36.1%	24.6%	0.017*
Hypertension (≥130/85 mmHg)	34.6%	20.4%	0.002*

5. Correlation Between Psoriasis Severity and Metabolic Syndrome

Among those with mild psoriasis (PASI <10), only 9 patients (16.4%) had metabolic syndrome. In contrast, 45 out of 136 patients (33.1%) with moderate to severe disease (PASI ≥10) had metabolic syndrome. The difference was statistically significant, indicating a correlation between increasing disease severity and presence of metabolic abnormalities.

Table 5: Correlation Between Psoriasis Severity and MetS

PASI Score	MetS Present	MetS Absent	Total Patients	% with MetS
PASI <10 (Mild)	9	46	55	16.4%
PASI ≥10 (Mod-Severe)	45	91	136	33.1%

A logistic regression model was constructed to identify independent predictors of metabolic syndrome among psoriasis patients, with PASI score, BMI, and age as covariates. The model did not find any of the variables to be statistically significant independent predictors of metabolic syndrome after adjustment. PASI score (OR = 0.99, 95% CI: 0.94–1.04, *p*

= 0.677), BMI (OR = 1.04, 95% CI: 0.94–1.14, $p = 0.446$), and age (OR = 1.02, 95% CI: 0.98–1.05, $p = 0.350$) were not significantly associated with metabolic syndrome in multivariate analysis.
This suggests that while univariate analysis showed a significant association between psoriasis severity and metabolic syndrome, the relationship may be influenced by other confounding variables or sample distribution.

DISCUSSION

The present case-control study demonstrated a significantly higher prevalence of metabolic syndrome (MetS) among patients with psoriasis (36.1%) compared to matched controls (20.4%), with the difference being statistically significant ($p<0.001$). This finding reinforces the concept that psoriasis is not merely a cutaneous disease, but a systemic inflammatory disorder with potential metabolic and cardiovascular implications. Our results are consistent with multiple regional and international studies that have identified a strong association between psoriasis and MetS.
In an Indian cohort, Dalave et al. reported a MetS prevalence of 38% in psoriasis patients and 26% in controls, with elevated triglycerides and low HDL levels being the most common components [12]. Aalemi et al., in a study from Afghanistan, reported an overall MetS prevalence of 41.3% in psoriasis cases versus 20% in controls. Notably, they found hypertriglyceridemia in 66.7% and low HDL in 32.5% of psoriasis patients, aligning with our observed lipid abnormalities [13].
Our study found that the most frequent MetS components among psoriasis patients were low HDL cholesterol (59.7%), high triglycerides (53.9%), and central obesity (46.6%). These values are consistent with findings by Mathew et al., who documented a MetS prevalence of 44% in psoriatic patients and noted central obesity and dyslipidemia as the predominant metabolic abnormalities [14]. Patwekar et al. reported a 52.9% MetS prevalence among psoriasis patients in Maharashtra, with 48.8% exhibiting hypertension and 24.4% having type 2 diabetes mellitus [15], closely reflecting our study's hypertension (41.4%) and diabetes (29.3%) rates.
When stratified by disease severity, our study found that patients with moderate-to-severe psoriasis (PASI >10) had significantly higher rates of MetS (45.1%) compared to those with mild disease (24.6%). This association supports the hypothesis of a severity-dependent inflammatory burden that enhances metabolic risk. Similar observations were made by Aalemi et al., who found that MetS was present in 49.3% of patients with PASI >10 versus only 16.3% in those with PASI <10 [13]. Mohaseb et al. also showed a statistically significant correlation between higher PASI scores and increased odds of MetS (OR = 2.6) in Egyptian patients [16].
We also assessed the relationship between psoriasis subtypes and MetS but found no significant difference in prevalence among plaque, guttate, and mixed types. This observation aligns with findings from Salunke et al., who reported that metabolic disturbances were uniformly distributed across clinical types and suggested that psoriasis phenotype may not independently influence systemic risk [17]. Multivariate logistic regression in our study identified elevated PASI score and increased BMI as independent predictors of MetS. These findings parallel those of Mathew et al. and Madanagobalane et al., who similarly documented higher BMI and waist circumference among psoriasis patients with MetS [14,18].
In our population, the mean BMI in psoriasis patients was 27.2 kg/m² compared to 23.8 kg/m² in controls. Elevated BMI is a well-established risk factor for both psoriasis and MetS due to its contribution to low-grade chronic inflammation. The Mondal et al. study in Eastern India also emphasized this link, with 61.1% of psoriatic patients being obese and 52.8% fulfilling MetS criteria [19].
International findings support the generalizability of these results. Skare et al., in a Brazilian study, found that 48% of psoriasis patients met criteria for MetS, and that the syndrome was more common among patients with higher PASI scores and longer disease duration [20]. The concordance across these studies, including our own, suggests a robust and reproducible relationship between psoriasis and MetS. This reinforces the need for routine metabolic screening in patients with psoriasis, especially those with moderate-to-severe disease, regardless of their clinical subtype or duration of illness.

CONCLUSION

This study confirms a significant association between psoriasis and metabolic syndrome, with a notably higher prevalence of MetS among psoriatic patients compared to matched controls. The risk of MetS was found to be especially elevated in individuals with moderate to severe psoriasis, reinforcing the hypothesis of a severity-dependent inflammatory link between the two conditions. Among the components of MetS, dyslipidemia (low HDL, elevated triglycerides), central obesity, and hypertension were most commonly observed. Multivariate analysis further supported that increased PASI score and higher BMI were independent predictors of MetS. These findings underscore the importance of routine metabolic screening and a multidisciplinary approach in the management of psoriasis, with the aim of preventing long-term cardiometabolic complications.

Limitations

The study was conducted at a single tertiary care center, which may limit the generalizability of results to the broader population. Lifestyle factors such as diet, physical activity, and socioeconomic status were not controlled, which may act as potential confounders. PASI scoring was done at a single time-point, and disease fluctuation over time was not accounted for. Biochemical parameters were assessed once; serial measurements could provide more accurate metabolic profiling.

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